Abstract

Process for preparing CaF_2 lens blanks especially for 193 nm and 157 nm lithography with minimized defects

Homogeneity residuals of the refractive index have a strong influence on the performance of lithography tools for both 193 and 157 nm application wavelengths. By systematic investigations of various defects in the real structure of CaF_2 crystals, the origin of homogeneity residuals can be shown. Based on a quantitative analysis we define limiting values for the individual defects which can be either tolerated or controlled by optimized process steps, e.g. annealing. These correlations were carried out for all three relevant main crystal lattice orientations of CaF_2 blanks. In conclusion we achieved a strong improvement of the critical parameters of both refractive index homogeneity and striae for large size lens blanks up to 270mm diameter.